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Understanding Indian Consumers' Propensity to Purchase Electric Vehicles: *An Analysis of Determining Factors in Environmentally Sustainable Transportation*

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Abstract: India's regulatory focus on environmental sustainability prompts investigation into the determinants influencing Indian consumers' adoption of electric vehicles (EVs). This study explores five key factors—utility, context, environmental concerns, intrinsic motivations, and barriers—influencing the embrace of EVs in sustainable transportation. Integrating rational choice theory and self-deterministic theory, this quantitative research employs Smart PLS to analyze 357 survey responses from India. Findings highlight the paramount role of perceived utility, encompassing cost savings and driving range, as a significant predictor of EV adoption intentions. The study underscores the necessity of considering practical advantages and psychological motivations while addressing barriers to EV adoption. This research contributes insights into understanding Indian consumers' attitudes towards EVs, emphasizing the importance of environmentally sustainable transportation solutions. The outcomes hold implications for policymakers and industry stakeholders seeking to foster sustainable mobility practices in India's evolving automotive landscape.

Keywords: Environmental, Sustainability, Renewable Electric Vehicles, Smart PLS, Willingness to Purchase, Adoption Intentions, Psychological Influences, Driving Range, Reliable Indicator

1. Introduction

Electric cars are now being developed as a practical response to fossil fuel shortages and environmental problems, particularly those involving carbon dioxide (CO2) emissions. Traditional transport-related environmental problems are getting worse. For example, according to the EEA (2019), transport is responsible for approximately 5% of greenhouse gas emissions. For example, the transportation in the United States was responsible to the most significant share of greenhouse gas emissions in 2016 (28%) (EPA, 2019). As a result, several governments have introduced effective regulations to mitigate environmental problems, including encouraging people to use electric vehicles, in light of the significance of acting to combat the global warming (Brady and O'Mahony, 2011). The over-a-century-

old automobile business is preparing for change. The rise in the price of fossil fuels, as well as the environmental impact of their emissions, has prompted a shift in individual mobility patterns. The sector is increasingly shifting away from internal combustion engines and towards electric cars (EVs).EVs are propelled by electric motors, and electricity is supplied by a rechargeable battery or other portable energy storage device. These automobiles are energy efficient, emitting less greenhouse gases (GHGs) and producing less noise. Encouraging the use of electric vehicles has grown recently, particularly in developed countries.

The number of electrical vehicles in India has been increasing in recent years, but it is still relatively low compared to traditional petrol and diesel vehicles. However, the Indian government has set ambitious targets for the use of electricity and the adoption of electric vehicles in the nation.The government of India introduced the FAME India (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) programme in 2018. program with a budget of INR 10,000 million (approximately US$1.4 billion) to encourage the use of electric cars. Under this scheme, subsidies are offered to buyers of electric vehicles and manufacturers of the infrastructure for charging electric automobiles. The Indian government has also announced a target of 30% of all vehicles on Indian roads being electric by 2030. To achieve this goal, the government has implemented various measures, such as reducing taxes on electric vehicles, providing incentives for the establishment of charging infrastructure, and mandating that a certain percentage of all new vehicles sold must be electric. Auto majors such as Tata Motors, Mahindra & Mahindra and Hyundai already offer electric vehicles in India, and new players such as Ola Electric and Ather Energy are entering the market. The electric two-wheeler has also gained popularity in India, with models like the Bajaj Chetak and TVS iQube gaining traction. While the use of electric vehicles in India is still relatively low, the Indian government has set ambitious targets for their adoption and introduced various measures to encourage their use. As the cost of electric vehicles comes down and charging infrastructure improves, the adoption of electric vehicles in India is likely to increase in the coming years.

Factors affecting EV adoption may vary depending on the demographic and geographic distribution of a location. The majority of studies were carried out in industrialized nations with access to infrastructure, EV technological considerations, and financial reasons. Given that India is a geographically vast nation, it should be examined to see if certain variables can affect people's perceptions of buying an electric vehicle (EV). This leaves a gap in our understanding of how impediments affect consumers' intentions to buy electric vehicles.

2. Conceptual Framework and Hypothesis Development

The conceptual model utilizes Self-deterministic theory (SDT) and Rational Choice Theory (RCT). These theories are pivotal in comprehending the multifaceted factors influencing Indian consumers' attitudes towards electric cars within the realm of environmentally sustainable transportation. SDT emphasizes intrinsic motivations, while RCT underscores rational decision-making processes, both offering insights into the complex dynamics guiding Indian consumers' preferences and behaviors regarding the adoption of electric vehicles in the context of sustainable mobility.

Self-deterministic theory (SDT)

SDT, founded by Deci and Ryan (1985), synthesizes personality and motivation studies rooted in James (1890).Deci and Ryan (1985) had some conflict with this movement in the 1960s as motivation

theorists turned away from emotive processes and towards cognitive processes. They held that a person's assessment of a goal's importance is a more powerful motivator than only a person's cognitive assessment of reaching a particular goal. According to Ryan and Deci (2000), motivation theory should examine how achieving a goal satisfies needs that value the goal via the lens of psychological needs. SDT is interested in the drive of individuals to attain autonomy, which happens when people exhibit self-determined behaviour. According to the theory, the concepts of knowledge and control events have an impact on how autonomous a person feels when making decisions. Informational events are those in which the person feels free to participate and finds fulfilment; control events are those in which the person feels forced to participate and finds less fulfilment (Bagga & Bhatt, 2013). Intrinsic and extrinsicmotivation are the two fundamental categories in the theory (Deci and Ryan, 1985, 1991).

Intrinsic Factors and Purchase Intention

Individuals gain personal happiness through intrinsic motivation, which includes things like reputation, autonomy, and trust. According to O'Reilly, Chatman and Caldwell, intrinsic motivation can be essential to commitment, motivation in businesses such as satisfying consumers when purchasing electric vehicles. Examples of intrinsic motivation include reading a book because the subject fascinates you, playing a musical instrument because you love the sound it makes, or solving a puzzle because you find it challenging and rewarding. Intrinsic motivation has been found to be associated with a number of positive outcomes, such as greater creativity, better academic performance, higher levels of engagement, and greater persistence in the face of obstacles. It is considered a key driver of human behavior and a fundamental aspect of human nature. If there is an intrinsic benefit to doing well at work, intrinsic motivation can lead to personal happiness. In addition, intrinsic motivation often leads to pleasure and enjoyment. What makes something delightful or interesting is the best approach to defining intrinsic motivation. When a person is intrinsically motivated, they are more inclined to respond to challenges or joy than to external demands or rewards. Intrinsic motivation was used to identify animals' behavior where they often interact because they are exploratory and was driven by curiosity behavior without an external reward motive. Hence, we formulate the
hypothesis:

H1: Intrinsic Factor is associated with EV purchase intention.

Extrinsic Factors and Purchase Intention

Extrinsic motivation, when doing something differently, produces a distinct result. Extrinsic motivation exhibits varying degrees of autonomy, according to several SDT propositions. For example, a child who completes his schoolwork out of fear of parental reprimand is extrinsically motivated because he expects a consequence. Similarly, a student who completes his work as if it were personally beneficial to his chosen career is intrinsically motivated because he is doing it for value rather than out of interest or passion. Both cases use tools. The first example involves compliance with external authority, while the second involves intentional action. External regulations are actions driven by external events towards people, such as a warning, a penalty, a prize, etc. The characteristic of imposed regulations is when a person internalises a set of external regulations. For example, a person does not use a service because of their desire, but feels that they should use it (lack of self-confidence or self-esteem). These motivational factors have a significant influence on how customers perceive products and services. For the purpose of this study, we examine both intrinsic and extrinsic motivations to predict customer purchasing behavior for electric cars. In a variety of sectors, including education (Niemiec & Ryan, 2009; Naeghel et al., 2016), online learning (Hartnett, 2015; Sreb et al., 2009), etc., the self-determination theory has been

widely applied. According to Ntoumanis (2005) and Lin et al. (2009), elements from the self-determination theory are crucial in determining intention or purchasing behaviour. Hence, we formulate the following hypothesis

H2: Extrinsic Factor is associated with EV purchase intention.

Rational Choice Theory (RCT)

This theory is based on the premise that humans are rational beings who have consistent preferences and will act in a predictable manner to achieve their goals. Rational choice theory is often associated with economics, where it is used to model individual decision-making in markets(Scott, 2000). However, it has also been applied to a wide range of other social phenomena, including political behavior, crime, and social networks. Looking back, we see that this theory was extensively discussed and developed by (Satz, & Ferejohn, 1994), {Becker,(&Mehlkop, 2006). Advocates of RCT believe that to be the case rather regularly the particular decision-making unit under consideration is "typical" or "representative" of a larger population, such as buyers or sellers in a certain market. After establishing individual behaviour, the research typically shifts to examining how distinctive decisions interact to produce results. In essence, the RCT tends to assume rational decision from the perspective of the consumer in order to explain social phenomena (Coleman, 1990; Hechter and Kanazawa, 1997). The fundamental idea behind RCT is the process of identifying the best possibilities and selecting the best one based on a measurable outcome (Levin and Milgrom, 2004).

In the context of electric vehicles (EVs), rational choice theory suggests that individuals will adopt EVs if they perceive the benefits to outweigh the costs. Some of the benefits of EVs that individuals may consider include Lower operating costs as EVs have lower fuel costs compared to traditional gasoline-powered vehicles, as electricity is generally cheaper than gasoline, Environmental benefits as EVs have lower greenhouse gas emissions compared to gasoline- powered vehicles, which can appeal to individuals who are concerned about the environment, Performance benefits as EVs can offer better acceleration and handling than gasoline-powered vehicles. On the other hand, some of the costs of EVs that individuals may consider include Higher upfront costs as EVs are generally more expensive to purchase than traditional gasoline- powered vehicles, although this cost difference is decreasing over time, Range anxiety as EVs have a limited driving range before they need to be recharged, which can cause anxiety for some drivers, Charging infrastructure as EVs require access to charging infrastructure, which may be limited in some areas.RCT framework works on three components Utility, Constraints, Belief

Utility and Purchase Intention

When making a rational purchase decision, customers prioritize the social outcome based on utility and prejudge the usefulness of the purchased goods (Oh, & Cheon,2018). Making rational consumption decisions requires taking into account utility since prejudgment includes both individual preferences and actual conditions. Utility functions are commonly used to describe preferences in prejudgment. The "daily utility of electric vehicles," or the reason why most people buy electric cars, is why utility is so important for electric cars (Rezvani et al., 2015). Using a vehicle to get to and from work or other locations has an immediate negative influence on a person's quality of life. Hence, we formulate the following hypothesis

H3: Utility Factor is positively associated with EV Purchase Intention.

Constraints and Purchase Intention

When consumers want to buy something, they are constrained by factors including their budget. The option to purchase pricey electric automobiles is an excellent illustration of how the financial situation can successfully curb excessive spending. The impact of constraints on the costs and advantages of various remedies emphasises the importance of both subjective and objective limitations (Dong, et.al.,2020). Options become an important premise for customers as a result of constraints. Although customers could rationally decide to purchase whatever they want, this should rely on their unique situation. Hence, we formulate the following hypothesis

H4: Constraint Factor is associated with EV Purchase Intention.

Environmental Belief and Purchase Intention

A sensible consumption choice is based on a variety of considerations, including personal convictions. A vegetarian, for instance, often won't buy meat. Belief provides both internal and external justifications for behaviour. In this study, we use Aguiar and de Francisco's (2009) concept of social identity as a set of beliefs that defy externalist reductionism. According to them, the hypothesis "describes what is actually going on inside of us when we reason," as stated in Satz and Ferejohn's 1994 paper. According to a specific presupposition (Williams, 1981; Hedström, 2005), a person's aims and beliefs affect their decision-making because they serve as explanations for action. If someone likes option A over option B, it's because they think option A better satisfies their needs or ideals. These subjective internal desires and ideas encourage consumers to reach their own conclusions. Studies assessed how consumer intentions are influenced by environmental consciousness, (Degirmenci, & Breitner,2017; Dutta, & Hwang,2021).). Individual environmental awareness primarily focuses on Indian consumers' willingness to purchase electric automobiles in order to safeguard the environment. In general, the rational choice theory predicts that people will consider the costs and benefits of adopting an EV, and that policies and incentives that lower costs or raise rewards may be successful in boosting adoption rates. Hence, we formulate the following hypothesis

H5: Pro Environment belief is associated with EV Purchase Intention.

Research Methodology:

Quantitative methodology, prevalent in mainstream EV studies, was favored over qualitative methods due to its focus on hypothesis testing (Lichtman, 2013; Bryman, 2008). Given our interest in understanding the determinants of Indian consumers' EV purchasing decisions, a quantitative approach was deemed fitting.To gauge attitudes scientifically, we employed the validated Likert scale, pivotal in quantifying nuanced perspectives. A meticulously designed questionnaire, comprising two sections—background information and queries on attitudes, perceptions, and purchase intentions—was dispersed. Our sampling strategy aimed for a representative Indian population subset, enhancing data accuracy and enabling generalizations (Mayer,2015).Strategic measures were taken to ensure an equitable sample distribution, including varied city distributions and balanced gender and age ratios. The survey, disseminated through social media platforms like WhatsApp and Telegram, prioritized anonymity to solicit candid responses. Despite distributing 700 surveys, a response of 357 participants yielded a 51% response rate, aligning with Pallant's (2016) recommendation that a smaller sample size should exceed 150. This sample size suffices for our Smart PLS SEM analysis, allowing for robust data analysis and meaningful conclusions regarding Indian consumers' EV purchase intentions. Common method bias

(CMB) was also not an issue with this study as confirmed by Harman's one-factor test (Podsakoff et al., 2003), as the results revealed that the first factor accounted for only 38.99% (i.e.< 50%) of the variance Saxena, et. al. ,2022)..

As stated, measurement items for variables were adapted from scales that had already been validated and then modified for the study's setting. A 5-point Likert scale was used to evaluate each variable, with one denoting "strongly disagree" and five denoting "strongly agree". Five components were evaluated as the major influence variables: utility, constraints, environmental beliefs, extrinsic factors, and intrinsic factors. At least three closely related sub- questions were used to measure each factor. The dependent variable's goal is to investigate Indian consumers' desire to buy electric cars. The questions in Table 1 are designed to gauge how willing respondents are to buy an electric car. The dependent variables for our study are Purchase Intention and Attitude towards Buying Electric car (Table 1).

The survey was disseminated through various online platforms, garnering a total of 357 respondents, constituting 100% of the sample size. Among these participants, 153 (42.9%) identified as female, while 204 (57.1%) identified as male. Regarding age distribution, 119 respondents (33.3%) fell within the 18 to 25 age bracket, 201 (56.3%) were between 25 and 35 years old, 33 (9.2%) were in the 35 to 45 age group, and 4 (1.1%) were aged between 45 and 55.In terms of income, the survey captured responses from various income brackets: 93 (26.1%) respondents reported earning between 3 and 6 lakhs, 36 (10.1%) between 6 and 9 lakhs, 142 (39.8%) between 9 and 15 lakhs, 80 (22.4%) between 15 and 24 lakhs, and 6 (1.7%) earning more than 24 lakhs. The survey's participant occupations included 67 (18.8%) postgraduate students, 222 (62.2%) employees, 43 (12%) self-employed individuals, and 25 (7%) respondents who were business owners.

3. Measurement and Descriptive Analysis

From the Table 2 as the values of standard deviation and skewness are both greater than 1.5, and Kurtosis is greater than 3, it has been determined that the data is normally distributed. Thus, according to Ahmed et al. (2019), the data has a normal distribution. The results of the measurement model showed that the factor loadings for Utility, Extrinsic, Intrinsic, Attitude towards Buying Electric vehicle are greater than 0.70 , for same factors rho_ A is greater than 0.70, CA is greater than 0.70, composite reliability is greater than 0.70, and, in accordance with Fornell and Larcker (1981), AVE is greater than 0.50 for factors mentioned above. The convergent validity and reliability of the various scales and conceptions have therefore been met. The square roots of the AVE values are larger (in diagonal readings) than the correlation of the constructs, according to this study's evaluation of the discriminant validity, which is shown in Table 3.

Table 1: Measurement Items

Construct	Statements	Author
Utility	1) I prefer driving range while purchasing electric vehicles. 2) I want to reduce the number of charging sessions which will help me to decide if electric vehicle needs to be bought. 3) The higher driving range of the electric vehicles will motivate me to purchase electric vehicle	Axsen et al. (2012)
Constraint	1) Number of Charging points 2) Customers have concern that charging points are enough available for long rides 3) Cost of the ownership 4) Government Incentives	Wittek et al., 2013
Environmental Belief	1) Electric vehicles are helpful for environment protection. 2) I am aware about the environment protection. 3) I am willing to pay more to buy environmentally friendly products. 4) Electric vehicles reduce air pollution	Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014)
Extrinsic	1) Other people are positively impressed that I drive electric vehicle. 2) I am proud when I am driving electric vehicle. 3) Others perceive I am a rich person when I am driving an electric vehicle. 4) Driving an electric vehicle improves the good ways I am perceived by others. 5) Others perceive me as a fashion person when I am driving an electric vehicle.	Kumar, R. R., Israel, D. and Malik, G. (2018).
Intrinsic	1) I believe I have the ability to purchase a electric vehicle. 2) If it were entirely up to me, I am confident that I will purchase a electric vehicle 3) I see myself as capable of purchasing a electric vehicle in the future. 4) . I have the willingness to purchase a electric vehicle. 5) I feel that purchasing a electric vehicle is totally within my control. 6) I am contributing to environment by buying electric vehicle.	Kumar, R. R., Israel, D. and Malik, G. (2018).
Attitude for buying	1) Electric vehicles are reliable. 2) Buying electric vehicle would be a wise choice 3) Electric vehicles are comfortable to drive same as traditional vehicles	Vinita Bhatia, (2018)
Purchase intention	1) My next vehicle purchase would be an electric vehicle 2) I would recommend my family and friends to buy electric vehicles 3) I think electric vehicle is the need of hour so I will surely buy it.	Vinita Bhatia, (2018)

The convergent validity and reliability of the various scales and conceptions have therefore been met. The square roots of the AVE values are larger (in diagonal readings) than the correlation of the constructs, according to this study's evaluation of the discriminant validity, which is shown in Table 4

Table 4. Discriminant validity – Fornell-Larcker criterion

Construct	ATB	C	EB	EXT	INT	PI	U
ATB	0.958						
C	0.543	0.607					
EB	0.586	0.736	0.62				
EXT	0.86	0.668	0.636	0.899			
INT	0.858	0.714	0.7	0.849	0.878		
PI	0.56	0.59	0.494	0.593	0.678	0.961	
U	0.557	0.667	0.666	0.611	0.527	0.203	0.85

.

As a result, the constructs' discriminant validity criteria has been met. The results of Table 5 showes that the correlational Heterotrait-Monotrait (HTMT) ratio is less than 0.90.

Table 5. Heterotrait-Monotrait Ratio (HTMT)

Construct	ATB	C	EB	EXT	INT	PI	U
ATB							
C	0.729						
EB	0.586	0.894					
EXT	0.926	0.073	0.705				
INT	0.918	0.985	0.786	0.892			
PI	0.598	0.937	0.646	0.618	0.739		
U	0.623	0.307	0.719	0.667	0.565	0.209	

4. Structural Model

The second stage involves analysing the structural model's R2 and path coefficient results. The values of R2, which determine the importance between independent and dependent variables, are shown in Table 3. Additionally, this is among the most significant criterion for the structural model's validation. The R2, also referred to as a coefficient of determination and goodness of fit measure, was shown by the results of Table 1 and Figure 1. The R2 value displayed the total variance in percent that accounts for the change in the dependent variable brought on by the independent variable. As a result, Figure 1 demonstrated that the R-squared of attitude to buy electric car is 0.832, indicating that the enlarged dimensions of the model are responsible for a total change of 83.2% of ATB. Similarly, the R2 for Purchase Intention(PI) is 0.372, showing that ATB has a 37.2% likelihood of causing PI to occur.

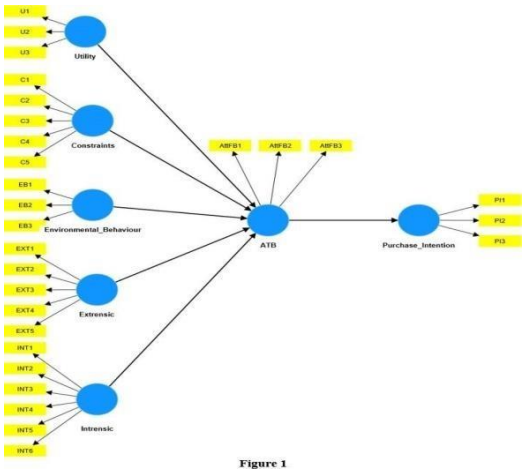

Figure 1

5. Hypothesis Testing and Discussions

The results presented in Table 6 confirm the direct relationship between the considered predictors and their respective dependent variables as hypothesized. Specifically, the data indicates that Utility, Attitude, Constraint, Extrinsic, and Intrinsic factors all exhibit a positive and direct impact on their

related dependent variables, with T values exceeding 1.96, except for the Environmental belief factor, which shows a T value lower than 1.96. Additionally, Attitude significantly influences Purchase Intention, supported by p-values less than 0.05. Therefore, Hypotheses H1, H2, H3, and H4 are accepted, while H5 is rejected based on these findings.

In Figure 1, Attitude to Buy electric cars is depicted as a mediating variable. Table 7 analysis suggests a specific indirect relationship (mediation) of Attitude to Buy (ATB) significantly influencing the Extrinsic and Intrinsic factors. However, it's noteworthy that ATB shows no impact on Environmental belief. Furthermore, ATB operates as a moderating variable for Constraint and Utility factors.

Table 6. Postulated direct association

Direct Path	T statistics (|O/STDEV|)	P values	Decision
Attitude -> Purchase Intention	13.312	0	Supported
H4 : Constraint -> Attitude	2.098	0.036	Supported
H2 : EXTRENSIC -> Attitude	7.114	0	Supported
H5 : Environmental belief -> Attitude	0.424	0.672	Not-Supported
H1 : INTRENSIC -> Attitude	4.792	0	Supported
H3 : Utility -> Attitude	2.076	0.038	Supported

Note: Null hypotheses rejected at: $p < 0.05$ and $p < 0.01$.

Table 7 Mediation evaluation

Indirect Path	T statistics (|O/STDEV|)	P values	Decision
Constraint -> Atitude -> Purchase Intention	1.97	0.049	Supported
EXTRENSIC -> Atitude -> Purchase Intention	6.072	0	Supported
INTRENSIC -> Atitude -> Purchase Intention	4.154	0	Supported
Utility -> Atitude -> Purchase Intention	1.971	0.049	Supported
Environmental belief -> Atitude -> Purchase Intention	0.424	0.671	Not-Supported

Note: Null hypotheses rejected at: $p < 0.05$ and $p < 0.01$.

Our study emphasizes the positive impact of intrinsic factors on consumers' inclination to purchase electric vehicles (EVs). It suggests that individuals lean towards EVs when convinced about long-term cost savings and environmental friendliness. Moreover, reliability and minimal maintenance requirements of EVs contribute to consumer decisions. As EV technology advances and becomes more accessible, there's an expected surge in consumer preference. This trend aligns with the global shift towards sustainable energy solutions, driving increased demand for EVs. Investments in infrastructure and technology, especially in charging, will further propel EVs as a practical and sought-after option. Indian consumers are notably influenced by external perceptions regarding EV adoption. Social considerations, prevalent in Indian culture, impact purchase decisions. Societal values, emphasizing appearances and social status, drive consumer choices. The association of electric vehicles with environmental consciousness, sophistication, and modern technology encourages their acceptance among consumers. Aligning with these societal norms can motivate consumers to opt for EVs.Our findings underscore the significance of driving range in influencing EV adoption, notably the presence of "Range Anxiety." This anxiety arises due to concerns about insufficient charging infrastructure, affecting consumer confidence in EVs. Government initiatives in charging infrastructure development and standardizing charging protocols can alleviate range anxiety, making EVs a more practical choice for consumers. Charging infrastructure plays a pivotal role in Indian consumers' EV purchase decisions. Accessibility to charging outlets is a critical factor. While free installation has addressed daily charging concerns, long-distance travel remains an issue. The higher initial cost of EVs, coupled with apprehensions about ownership expenses, impacts adoption. Government incentives significantly influence consumers' willingness to purchase EVs and drive adoption. Contrary to expectations, our

research reveals that Indian consumers prioritize technology, functionality, and cost over environmental sentiments when purchasing vehicles. EVs, while offering potential savings and environmental benefits, still face challenges due to their higher cost compared to conventional vehicles. Lack of awareness about EV advantages complicates persuading consumers to switch. Increased penetration of EVs can occur by enhancing charging infrastructure, reducing upfront costs, and raising awareness.

6. Theoretical and Managerial Implications

The study on the Adoption of Electric Vehicles offers both theoretical and managerial implications that illuminate the multifaceted nature of factors influencing consumer decisions regarding electric vehicle (EV) adoption. Understanding these implications is vital for policymakers and industry stakeholders seeking to promote the adoption of EVs. The research underscores the significance of perceived utility and constraints in shaping adoption decisions. It highlights the importance of considering both tangible benefits (cost savings, environmental advantages) and practical barriers (charging infrastructure, range anxiety) in comprehending consumer attitudes. Acknowledging intrinsic factors (personal values, beliefs) and extrinsic motivators (social norms, peer influence) is crucial. Aligning EV adoption with individual values and beliefs, as well as leveraging social influence, emerges as pivotal strategies for promoting adoption. Recognizing the complex interplay between different factors in adoption decisions is essential. Perceived constraints moderate the relationship between perceived utility and adoption intentions. Similarly, perceived constraints moderate the relationship between intrinsic motivators and adoption intentions, showcasing how obstacles may hinder the influence of perceived benefits or intrinsic motivators on adoption.

Implications for Action, Policymakers and industry stakeholders should emphasize the perceived utility of EVs through awareness campaigns and financial incentives. Concurrently, resolving constraints like charging infrastructure inadequacies is crucial to boost adoption rates. Tailored strategies should address intrinsic and extrinsic motivators. By emphasizing the alignment of EV adoption with personal values and beliefs, and framing EVs as status symbols, adoption rates can be significantly influenced. Customized approaches targeting specific barriers faced by diverse consumer groups are imperative. Crafting strategies that cater to the motivations and constraints of different segments can foster more successful adoption outcomes. Collaboration between stakeholders and policymakers is critical. Synchronizing efforts to address perceived benefits, barriers, and motivators can significantly drive EV adoption. Coordinated initiatives can effectively promote adoption while mitigating barriers.

7. Conclusion

The world's largest unexplored EV market is in India. A robust charging infrastructure is necessary since there are many possible market hurdles that could limit the growth of the EV industry. The "Make in India" campaign promotes local production of parts, especially lithium- ion batteries, which must be made in India. To hasten the adoption of EVs, a new economic model must be developed that allows for high infrastructure utilization for both charging and exchanging options. Recent rules, including as the battery swapping legislation, that were passed to stimulate a shift towards green energy generation and decentralization of energy distribution are anticipated to result in the development of a well-established EV infrastructure across the country. Since India has yet to fully embrace electric vehicles, this market has a lot of opportunity to grow. Even though they now make up a very small fraction of India's overall vehicle industry, there are certainly a number of factors that could improve the widespread use of electric automobiles in that country. One of the key factors affecting India's adoption

of electric vehicles is the country's commitment to reducing greenhouse gas emissions and combating climate change. India is one of the top countries in the world for greenhouse gas emissions, and the government has set ambitious targets to reduce these emissions. Electric vehicles are thought to be a key component in achieving these goals because they produce no emissions when in use. Another obstacle driving the usage of electric automobiles in India is the rising cost of petrol. The price of both gasoline and diesel in India has traditionally been subsidized by the government of India, although in the past few decades there has been a movement in the direction of liberalization and market-based pricing. Electric vehicles are becoming a more enticing option for consumers looking to lower their commuting costs due to the ensuing spike in fuel prices. There are additionally a number of other factors and challenges which need to be overcome in order to stimulate an increased use of electric automobiles in India. One of these problems that is most crucial is the lack of a sufficient infrastructure for charging around the country. There still aren't as many electric vehicle stations for charging as the number of petrol stations, despite an increase. It seems that there still aren't nearly as many places to charge as the number of petrol stations, notwithstanding an increase. As a result, electric vehicle owners may have trouble finding an electrical outlet when they need one. Another issue is the high cost of electric vehicles, particularly when compared to regular petrol and diesel vehicles. Even if battery technology and production rates are projected to improve over the years to come, many Indian consumers currently cannot afford electric cars. Automakers must focus on developing electric vehicles which exceed the expectations of Indian consumers. Because Indian consumers are extremely cost-conscious, automakers must design Vehicles that can be both accessible and affordable to buy. EVs must also have a long enough driving range to satisfy the needs of Indian consumers. There are several steps that the Indian government along with other stakeholders might take to address these problems. One of the most important of these is funding the construction of a charging infrastructure. This may mean establishing charging facilities in public places like garages or shopping centers in collaboration with commercial companies. Additionally, it may require establishing monetary or tax-related concessions to entice private companies to spend money on charging infrastructure. Another critical step is developing policies to encourage the usage of electric vehicles. This might include regulations compelling government agencies and public transportation providers to use battery-powered cars in their fleets as well as consumer financial incentives like tax credits or rebates. Additionally, there is a requirement to increase public awareness of the benefits of electric vehicles. In India, electric car models are still in their infancy, so many potential consumers aren't likely to be familiar with the way they work or the benefits they offer. By engaging in public education initiatives, the problem may be remedied, and more people may be convinced to purchase electric vehicles. The adoption of electrically powered cars in India continues to be in its infancy, but there is a lot of room for growth in this market. A multitude of reasons, such as India's goal to reducing emissions of greenhouse gases and rising petrol prices, are driving the widespread acceptance of electric vehicles. While there are many challenges to be resolved, like a dearth of electrical infrastructure for charging and high costs, they aren't the only ones. India may progress towards an environmentally friendly and more sustainable mode of transportation in the approaching years by establishing charging infrastructure, adopting legislation that promote the adoption of electrically powered cars, and expanding the public's understanding of their advantages.

8. Limitations and Future scope

Limitations in this study stem from time and resource constraints, restricting data collection, analysis, and follow-up studies. Ethical considerations also impacted the study's scope, potentially restricting aspects involving animal or human subjects. The small sample size may compromise statistical

significance and power in detecting crucial effects. Given the limited sample and geographic focus, caution is advised in generalizing findings to India's entire population. Future research should expand the sample size, encompass diverse geographic areas, and consider socio-cultural influences on electric vehicle adoption. Understanding regional nuances and socio-economic factors will be crucial. While this study offers insights, comprehensive research is essential to fully comprehend India's electric vehicle adoption dynamics.

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